

H.A.P. 1/13/05

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences

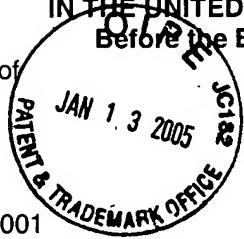
In re Patent Application of

PATRA et al

Serial No. 10/024,537

Filed: December 21, 2001

Title: PROCESS FOR THE PREPARATION OF DIMETHYL CUMENES



Atty Dkt. 4062-12

C# M#

TC/A.U.: 1764

Examiner: Thuan D. Dang

Date: January 13, 2005

Mail Stop Appeal Brief - Patents

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Correspondence Address Indication Form Attached.

NOTICE OF APPEAL

Applicant hereby **appeals** to the Board of Patent Appeals and Interferences
from the last decision of the Examiner twice/finally rejecting \$500.00 (1401)/\$250.00 (2401) \$
applicant's claim(s).

- An appeal **BRIEF** is attached in the pending appeal of the above-identified application \$500.00 (1402)/\$250.00 (2402) \$ 500.00
- Credit for fees paid in prior appeal without decision on merits -\$ ()
- A reply brief is attached in triplicate under Rule 41.41 (no fee)
- Petition is hereby made to extend the current due date so as to cover the filing date of this paper and attachment(s)
One Month Extension \$120.00 (1251)/\$60.00 (2251)
Two Month Extensions \$450.00 (1252)/\$225.00 (2252)
Three Month Extensions \$1020.00 (1253)/\$510.00 (2253)
Four Month Extensions \$1590.00 (1254)/\$795.00 (2254) \$
- "Small entity" statement attached.
- Less month extension previously paid on -\$ ()

TOTAL FEE ENCLOSED \$ 500.00

Any future submission requiring an extension of time is hereby stated to include a petition for such time extension.
The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our **Account No. 14-1140**. A duplicate copy of this sheet is attached.

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NIXON & VANDERHYE P.C.
By Atty: Duane M. Byers, Reg. No. 33,363

Signature: _____

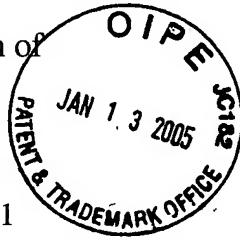
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For: PROCESS FOR THE PREPARATION OF DIMETHYL CUMENES

* * * * *

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APPEAL BRIEF

Sir:

Applicant hereby **appeals** to the Board of Patent Appeals and Interferences from the
Final Rejection dated April 13, 2004.

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(I) REAL PARTY IN INTEREST

The real party in interest is the owner of the subject application, namely, Council of Scientific and Industrial Research of New Delhi, India.

(II) RELATED APPEALS AND INTERFERENCES

The appellant, the undersigned, and the assignee are not aware of any related appeals, interferences, or judicial proceedings (past or present), which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

(III) STATUS OF CLAIMS

Claims 1-18 are pending and have been objected to and rejected. All of these claims are the subject of this appeal, but are not grouped as a whole. No claims have been substantively allowed.

(IV) STATUS OF AMENDMENTS

Since the date of the Final Rejection of April 13, 2004, the following events have occurred: a Notice of Appeal and Correspondence Address Indication Form were filed on October 13, 2004. Thus, the claims stand as amended on February 13, 2004, but with the following correction request.

The Final Office Action correctly notes that "So" in claim 1 is a typographical error that should read "Si" (and for which claims 1-18 were objected to). The Applicant agrees with the Examiner and requests that the appeal continue with this correction of claim 1. Because the new Rules do not permit the concurrent filing of an Amendment After Final along with the Appeal Brief to correct this typographical error in claim 1, the Applicant respectfully requests the correction/amendment during appeal.

(V) SUMMARY OF CLAIMED SUBJECT MATTER

The invention of the claims relates to a specific process for the preparation of dimethylcumenes comprising alkylating a substrate comprising one or more xylene isomers with an alkylating agent in the presence of a solid acid zeolite catalyst selected from the group consisting of ultrastable zeolite Y (Si/Al = 5 to 50 ratio of Si to Al in zeolite Y) and zeolite Beta (Si/Al = 10 to 120 ratio of Si to Al in zeolite Beta), and separating the products formed in vapor phase. See, e.g., Application at page 2, lines 23-25, page 3, lines 11-17, and Examples 1-18.

(VI) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1-18 were properly rejected under 35 U.S.C. §103(a) as being unpatentable over Steigelmann et al. (U.S. Patent No. 5118896).¹

The claims are grouped and argued together.

¹ The Final Office Action also notes that "So" in claim one is a typographical error that should read "Si." The Applicant agrees with the Examiner and requests that the appeal continue with this correction. Because the new Rules do not permit the concurrent filing of an Amendment After Final along with the Appeal Brief to correct this typographical error, the Applicant respectfully requests the correction/amendment during appeal.

(VII) ARGUMENT

Claims 1-18 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Steigelmann et al. (U.S. Patent No. 5118896). *See* Final Office Action of April 13, 2004, at pages 2-4. Applicant respectfully requests the reversal of the rejection for the following reasons.

At the outset, it is important to note that the Applicant and Examiner agree about the following facts:

- i) the "field of catalyst is unpredictable and variations in the Si content in the zeolite catalyst can also effect the performance of the same catalyst in a particular process." *See, e.g.*, Final Office Action at page 4, lines 6-8, and Amendment of February 13, 2004, at page 6, lines 2-7.
- ii) Steigelmann does not teach the specific ratio of Si to Al -- as claimed in claim 1. *See, e.g.*, Final Office Action at page 3, lines 9-12, Amendment of February 13, 2004, at page 5, lines 18-21.
- iii) Steigelmann does not teach the formation of products in the vapor phase from which they are condensed out – as claimed in claim 1. *Id.*
- iv) Steigelmann does not teach the solid acid nature of the zeolite catalyst -- as claimed in claim 1. *See, e.g.*, Final Office Action at page 3, lines 9-12, Amendment of February 13, 2004, at page 5, lines 18-21 to page 6, line 1.

It is also important to note that Applicant believes that its claimed ranges of Al and Si, in conjunction with the other claim requirements, are critical to its invention and which results in very high catalytic activity and selectivity in the claimed alkylation.

Turning to the rejection based on Steigelmann, and as noted above, the catalyst field is extremely unpredictable. For example, minor pore size modifications can affect both selectivity and activity of the same catalyst in a particular process. Similarly, variations in the Si content in

a zeolite catalyst can also affect the performance of the same catalyst in a particular process.

Furthermore, the use of one type of catalyst, say zeolite X, in a particular process does not automatically indicate that all zeolites can and will provide the same kind of results.

The present invention uses steamed ultrastable zeolite Y or zeolite beta both having specific Si to Al ratios in order to successfully achieve the alkylation of xylenes to obtain dimethylcumenes. Some advantages of using such catalysts are given on pages 3, 4 and 15 of the application. Steigelmann does not teach, disclose or even remotely appreciate these inventive features. The Final Action correctly and readily acknowledges that Steigelmann does not teach these features, yet contends that the claims are obvious in this unpredictable field.

Moreover, and contrary to the Final Action's contention, there is no teaching in Steigelmann that the variation of Si to Al ratios in ultrastable zeolite Y or zeolite beta can actually enable alkylation of all the isomers of xylene. In fact, although Steigelmann includes xylene in the list of aromatics which can be generally alkylated, there is no specific mention of which isomers are alkylated. In this regard, the Steigelmann examples merely deal with ethylene conversion and ethylene – methane mixture conversion. As stated above, and as both the Applicant and the Examiner agree, results obtained using a specific catalyst in one process cannot be automatically extrapolated to other substrates, with different catalysts, even if the generic process is the same, i.e., alkylation.

The present invention seeks to solve a particular problem associated with xylene alkylation, namely, the fact that catalysts used in the prior art did not display conversion and selectivity for all xylene isomers. The problems faced with the prior art are discussed on pages 1-2 of the application.

The specific catalysts and ratios used in the present invention overcome the prior art problems and can be used with equal effect with all three xylene isomers, collectively or

individually, and can also be easily regenerated. In addition, the dimethylcumenes are formed with higher selectivity.

Candidly stated, Steigelmann is silent on the effect of Si to Al variation in a solid acid catalyst (and in the process specifically claimed). In fact, the Steigelmann teachings confirm that the level of predictability is low in the field of catalysts. Steigelmann readily acknowledges a myriad of complexities and problems in this field, including "deactivation and selectivity problems." See, e.g., Steigelmann at column 2, lines 21-22, 57-59. Moreover, Steigelmann readily admits heightened zeolite problems in vapor phase reactions and, therefore, focuses on liquid phase reactions. See, e.g., Steigelmann at column 2, lines 14-19, and column 3, lines 10-30. Further, the three sample catalysts prepared and used in the Steigelmann examples show different results and performance when the particle size or the particle diameters are different. The focus in Steigelmann is on the pore volume, pore radius and particle diameter. There is no teaching of Si to Al ratio variation or its effect on alkylation of all xylene isomers, and certainly no such teaching or suggestion for use in the complete process of claim 1.

Thus, it is respectfully submitted that the Final Action has erred in holding that the Si to Al ratios can vary depending on the structure of the catalyst and that this teaches the ratios used in the applicant's invention. Steigelmann in fact provides no guidance towards variation in the Si to Al ratios being a parameter effective to ensure alkylation of all xylene isomers. Steigelmann also provides no guidance towards alkylation of all xylene isomers to dimethylcumenes using a ultrastable zeolite Y catalyst or zeolite beta catalyst with the specific Si to Al ratios critically required in the claims. And, finally, Steigelmann provides no guidance about the claimed formation of products in the vapor phase from which they are condensed out. To say otherwise would be an improper use of hindsight based on the subject application.

In summary, the generalized teachings of Steigelmann do not render obvious the specifically claimed invention that requires:

a process for the preparation of dimethylcumenes comprising:

alkylating a substrate comprising one or more xylene isomers with an alkylating agent in the presence of a solid acid zeolite catalyst selected from the group consisting of ultrastable zeolite Y (Si/Al = 5 to 50 ratio of Si to Al in zeolite Y) and zeolite Beta (Si/Al = 10 to 120 ratio of Si to Al in zeolite Beta), and

separating the products formed in a vapor phase.

CONCLUSION

In conclusion, it is believed that the application is in condition for allowance; therefore, reversal of the Final Rejection and passage of the subject application to issue are earnestly solicited.

Respectfully submitted,

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(VIII) CLAIMS APPENDIX

1. A process for the preparation of dimethylcumenes comprising:
 - alkylating a substrate comprising one or more xylene isomers with an alkylating agent in the presence of a solid acid zeolite catalyst selected from the group consisting of ultrastable zeolite Y (Si/Al = 5 to 50 ratio of Si to Al in zeolite Y) and Beta (Si/Al = 10 – 120 ratio of Si to Al in zeolite Beta), and
 - separating the products formed in vapour phase.
2. A process as in claim 1 wherein said substrate and alkylating agent are contacted with said solid acid zeolite catalyst at a temperature in the range of 80 - 250°C and for a period of at least 1 hour.
3. A process as in claim 1 wherein the product is separated from the vapour phase by condensation at a temperature in the range of 0 - 3°C.
4. A process as in claim 1 wherein the substrate is selected from the group consisting of *o*-xylene, *m*-xylene, *p*-xylene and any mixture thereof.
5. A process as in claim 1 wherein the Si/Al ratio in said catalyst is between 5 to 20.
6. A process as in claim 1 wherein the alkylating agent is selected from the group consisting of propylene and propyl alcohols .
7. A process as in claim 2 wherein the temperature of the reaction is in the range of 100 - 200°C.
8. A process as in claim 2 wherein the temperature of the reaction is in the range of 120 - 180°C.
9. A process as in claim 1, wherein the molar ratio of xylene substrate to the alkylating agent in the feed is in the range of from 1:2 to 20:1.

10. A process as in claim 9 wherein the molar ratio of xylene substrate to the alkylating agent is in the range of 1:1 to 10:1.
11. A process as in claim 9 wherein the molar ratio of xylene substrate to the alkylating agent is in the range of 1:2 to 5:1.
12. A process as in claim 1 wherein the weight hourly space velocity (WHSV) of the feed is in the range of 0.5 to 30 h⁻¹.
13. A process as in claim 12 wherein the weight hourly space velocity (WHSV) of the feed is in the range of 1 to 20h⁻¹.
14. A process as in claim 12 wherein the weight hourly space velocity (WHSV) of the feed is in the range of 2 to 10h⁻¹.
15. A process as in claim 1 wherein the alkylation reaction is carried out in a fixed bed reactor or a batch reactor.
16. A process as in claim 1 wherein *p*-xylene is alkylated using isopropanol in the presence of zeolite beta catalyst.
17. A process as in claim 1 wherein *m*-xylene and *o*-xylene are alkylated using isopropanol as the alkylating agent in the presence of ultrastable zeolite Y (USY) as catalyst.
18. A process as in claim 1 wherein a mixture of *p*-xylene and isopropyl alcohol in a molar ratio of 4:1 is reacted in a fixed bed reactor in the presence of ultrastable zeolite Y catalyst.

(IX) EVIDENCE APPENDIX

None – other than the USPTO file history of the subject application.

(X) RELATED PROCEEDINGS APPENDIX

None.